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Injection Studies (Sources of Vertical Dilution)

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DISCLAIMER

AGS STUDIES REPORT NUMBER 97

Date 9/22/77 Time 0001-0500 Experimenters E. Raka, J-L LeMaire

Subject Injection Studies (Sources of Vertical Dilution)

OBSERVATIONS AND CONCLUSION

Procedure: A good spiraling beam of ≥ 1200 μsec duration with five turns @ 60 mA was first obtained. The HEBT emittance was also obtained along with SEM data. Attempts were made to measure the horizontal beam size by observing the loss rate as the J5 inside target was brought toward the center of the aperture (spiraling rate at injection is ≈ 3 cm/msec at $\bar{\beta}$). The vertical beam size was also measured for the 5 turn 4.3×10^{12} beam using the J19 targets. Also the bunched beam size at injection (five turn 3×10^{12}) was measured at J19. Finally, one half turn was injected and again an attempt was made to minimize the observed coherent oscillations about the equilibrium orbit.

Observations: The horizontal size measurement was inconclusive since some beam continued to survive to ≈ 1.1 msec even with the target at -0.400".

The five turn spiraling vertical beam size was 1.57" for 90% which is the same as obtained on 9/9/76 and corresponds to an emittance of ≈ 12.6 πμrad M. The 90% HEBT emittance was ≈ 6.2 πμrad M rather than the 7.4 π of #95. It appeared that the J19 vertical target would intercept the latter part of the spiraling beam first while the bottom target either intercepted the beam right after injection or equally over the duration of the beam. This same effect was noticed when the J19 targets were used to intercept the bunched beam at injection also. The 90% size of the bunched beam was found to be 1.75" or ≈ 15.67 πμrad M.

Again, it was found impossible to put the half turn beam on the injection orbit, so that no coherent motion was observed, using the last two steering dipoles. It was noted (as seen before in #93) that there appeared to be a relatively rapid change of the position about which the oscillations were occurring. The peak-to-peak amplitude of the oscillations at the nominal high intensity settings for the steering dipoles was ≈ 2 cm.

Conclusions: It is felt that the horizontal loss pattern anomaly could be due to the target not being long enough to intercept all of the beam in the vertical direction. Hence it is planned to increase both the J5 and J19 targets by one inch in length.

The results of the vertical target measurements and the inability to inject with no coherent oscillations could be due to the apparent rapid (non-adiabatic) equilibrium orbit change seen on the last two occasions, if, indeed, the motion is real and not an instrument error. This question will be investigated during subsequent studies periods.

The dilution of the vertical emittance after capture is to be expected and agrees essentially with the results of #94 at the same intensity.

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refers to previous studies report.

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